SPECIFICATION

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Recloseable Lid

Cross Reference to Related Applications

This application claims priority on United States provisional patent application Serial No. 60/350,719 filed November 13, 2001.

Background of Invention

Field of the Invention

[0001] The invention relates to a recloseable lid for use with a drinking cup. In one aspect, the invention relates to a reclosable lid assembly operable between an open position where a user can consume the contents of the cup and a closed position where the contents of the cup are inhibited from splashing. In another aspect, the reclosable lid assembly has characteristics suitable for disposable use, especially in the fast-food or take-out food market.

Description of the Related Art

[0002] Disposable cups with lids that can be installed to inhibit splashing while allowing consumption of the liquid contained therein are well-known in the industry. One type of lid incorporates a series of narrowly spaced, baffled slots through which the liquid can be consumed. The narrow spacing of the slots and the baffles minimize but do not eliminate splashing while allowing the liquid to be consumed. Another type of lid incorporates a flap that can be torn back from the rim of the cup toward the center of the lid and secured in an open position to provide a drinking aperture. The flap can be reattached to the rim of the cup, but it will not prevent spilling of the contents. While these lids have the benefit of being disposable and relatively splash-proof during consumption, they are not fully reclosable and liquid can be spilled when the consumer is not drinking from the cup.

[0003] There are non-disposable, reclosable lids that can be used with non-disposable cups that can sufficiently inhibit splashing during the normal operation of the motor vehicle. One such reclosable lid comprises a well that is sized to be received within the opening of the cup. Multiple O-rings are disposed about a peripheral wall of the well and contact the cup to form a liquid-seal therebetween. A bottom wall of the well has a through opening permitting the passage of liquids from the cup. A rotatable cover is positioned within the well against the bottom wall and includes a projection and a through opening. When the through openings of the well and the cover align, a consumer can drink the contents from the cup. When the projection is received within the well through opening, the cup is closed.

[0004] The reclosable well structure is advantageous in that the lid can be closed to inhibit splashing and to the extent liquid is splashed, it can be retained in the well. The lid is disadvantageous in that the well structure extends into the cup, which reduces the cup liquid capacity. The lid is also not suitable for use as a disposable lid in the fast-food or take-out food market because of its apparent manufacturing complexity.

[0005] The prior lids are also not suitable for disposable use in the fast-food or take-out food markets because they are made by injection molding. The nature of the injection molding process makes these lids unsuitable for disposable use because of the relatively high cost and low production rates. Disposable lids are typically fabricated from thermoforming or vacuum forming due to lower fabrication costs and higher production rates. Injection molded lids generally use a much greater amount of material and have a greater thickness than thermoformed lids. The additional material and thickness is well suited for non-disposable lids, but adds additional and unnecessary cost for a disposable lid where only a one-time use is anticipated.

[0006] The injection molding process is more suitable for making lids with complex shapes and strong connection/support structures, without a lot of material waste. The injection mold defines a three-dimensional cavity that is filled with molten plastic to form the lid. The mold can be made to accommodate almost any desired three-dimensional shape. However, the thermoforming process uses an effectively two-dimensional sheet of material that is pressed around a form. For example, a

recloseable lid having an integral closure device extending from the lid upper surface can be easily formed by injection molding. However, such a lid cannot be formed with the thermoforming process, unless the integral closure is formed by tearing-away a portion of the lid upper surface, because both the lid and closure device must be made from the same portion of the sheet.

[0007] The distinction between injection molding and thermoforming can be thought of as the injection molding process can form pieces having varying thickness whereas the thermoforming process can only make parts having a thickness equal to, or due to stretching, less than, the thickness of the sheet material. Therefore, while the injection molding process can have increased thickness portions, such as webs, gussets, and the like, no such increased thickness portion can be made with the thermoforming process.

[0008] The ability of the injection mold to be crafted to handle complex designs is disadvantageous when it comes to production rates. The mold must be closed, filled with molten plastic, which then must be cooled sufficiently to retain its shaped prior to the opening of the mold. In contrast, the thermoforming process uses a web of plastic that is heated to or beyond its glass state, which permits the web to be shaped but does not require a long cooling time as the injection mold system. Thus, the thermoformed web is shaped and advanced to the next production step much faster than with the injection mold. The end result being the thermoforming process has much higher production rates.

[0009] Therefore, there is a desire for a reclosable lid having the functionality of prior recloseable lids, yet the lid is suitable for disposable use and still maintain a seal after several cycles between the opened and closed positions.

Summary of Invention

[0010] The invention relates a reclosable lid for a drinking cup comprising a base and a cap in mating relationship which can rotate relative to each other. Both the base and cap are provided with an aperture for delivery of liquid therethrough. When the apertures are aligned, liquid may be removed from the cup. When the cap is rotated relative to the base so that the apertures are offset, removal and spillage of liquid will

be prevented.

[0011] In one embodiment the lid comprises a mounting ring defining a peripheral channel sized to receive the rim of a cup for mounting the lid to a cup. A base is provided and is connected to and extends from the mouting ring. The base has a drink opening and defines a well with an annular groove. A cap is provided and has a plug for closing the drink opening and an annular edge sized to be inserted into the well and received within the annular groove to rotatably mount the cap to the base. The cap can be rotated relative to the base between and opened position, where the plug does not close the drink opening, and an closed position where the plug closes the drink opening.

[0012] In another embodiment the lid comprises a mounting ring defining a peripheral channel sized to receive the rim of a cup for mounting the lid to a cup. A base connects to and extends from the mouting ring. The base has a drink opening for the passage of liquid from the cup through the lid when the lid is attached to the cup. A cap, rotatably mounted to the base, is rotated to operate the lid between and opened and a closed postion. The cap has a pass-through opening that aligns with the drink opening when the lid is in the opened position and a plug that aligns with the drink opening for closing the drink opening when the lid is in the closed position. the cap, mounting ring, and tab are formed from a plastic sheet and have a substantially uniform thickness.

Brief Description of Drawings

[0013] In the drawings:

[0014] FIG. 1 is a perspective view of a cup and first embodiment of a reclosable lid assembly according to the invention showing the lid in an open position for removal of liquid from the cup.

[0015] FIG. 2 is a perspective view of the cup and lid assembly of FIG. 1 showing the lid in a closed position.

[0016] FIG. 3 is an exploded view of the lid assembly of FIG. 1 showing a base and a cap, which collectively form a reclosable lid assembly.

[0017] FIG. 4 is a top view of the base of FIG. 3.

[0018] FIG. 5 is a bottom view of the base of FIG. 3.

[0019] FIG. 6 is a sectional perspective view of the lid assembly of FIG. 1 taken through line 6-6 of FIG. 1 showing the lid assembly in the open position.

[0020] FIG. 6A is a close-up view of a portion of the lid assembly of FIG. 6 detailing a mated detent structure of the lid assembly.

[0021] FIG. 7 is a sectional elevational view taken along line 6-6 of FIG. 1.

[0022] FIG. 8 is a top view of the cap of FIG. 3.

[0023] FIG. 9 is a bottom view of the cap of FIG. 3.

[0024] FIG. 10 is a sectional perspective view of the lid assembly of FIG. 2 taken through line 10-10 showing the lid assembly in the closed position.

[0025] FIG. 11 is a sectional elevational view taken along line 10-10 of FIG. 2.

[0026] FIG. 12 is a sectional perspective view of the lid assembly taken along major axes of the cap and base receptacles showing the cap rotated midway between the open position and the closed position so that the major axes are aligned.

[0027] FIG. 13 is an elevational view of the lid assembly of FIG. 12.

[0028] FIG. 14 is a sectional perspective view of the lid assembly of FIG. 1 taken through line 14-14 along the major axis of the cap receptacle showing the lid assembly in the closed position.

[0029] FIG. 15 is an elevational view of the lid assembly of FIG. 14.

[0030] FIG. 16 is a perspective view of an alternative construction of the base with a liquid spillage chamber and a vent for venting the cup and returning spilled liquid to the cup.

[0031] FIG. 17 is a sectional perspective view of the base of FIG. 16 and the cap of FIG. 1 showing the lid assembly with the alternative construction of the base taken along line 17-17 of FIG. 16.

[0032] FIG. 18 is an elevational view of the lid assembly of FIG. 17.

[0033] FIG. 19 is a perspective view of a cap and base comprising a second embodiment of the reclosable lid assembly according to the invention.

[0034] FIG. 20 is a plan view of the top of the base of FIG. 19.

[0035] FIG. 21 is a plan view of the top of the cap of FIG. 19.

[0036] FIG. 22 is a sectional view of the cap assembled onto the base to comprise the second embodiment of the lid assembly taken as an elevation view.

[0037] FIG. 23 is a sectional perspective view of the lid assembly of FIG. 22.

[0038] FIG. 24 is an exploded perspective view of a cap and base comprising a third embodiment of the reclosable lid assembly according to the invention showing the lid assembly oriented in an open position.

[0039] FIG. 25 is a plan view of the top of the cap of FIG. 24.

[0040] FIG. 26 is a plan view of the top of the base of FIG. 24.

[0041] FIG. 27 is a sectional perspective view of the cap assembled onto the base to comprise the lid assembly of FIG. 24 taken along line 27-27 showing the lid assembly in the open position.

[0042] FIG. 28 is a sectional view of the lid assembly shown in FIG. 27 taken as an elevation view along line 27-27 of FIG. 24.

[0043] FIG. 29 is a sectional perspective view corresponding to line 29-29 of FIG. 24 of the cap assembled onto the base to comprise the lid assembly according to the invention showing the cap rotated relative to the base to place the lid assembly in a closed position.

[0044] FIG. 30 is a sectional view of the lid assembly shown in FIG. 29 taken as an elevation view corresponding to line 29-29 of FIG. 24 showing the cap rotated relative to the base to place the lid assembly in a closed position.

[0045] FIG. 31 is an exploded view of a fourth embodiment recloseable lid according to

the invention and illustrates the base and cap.

[0046] FIG. 32 is a top perspective view of the assembled base and cap and shown in the closed condition.

[0047] FIG. 33 is identical to FIG. 32 except that the cap is rotated to place the lid in the open condition where a notch in the lid aligns with a drink opening in the base.

[0048] FIG. 34 is a top view of the assembled lid in the open condition.

[0049] FIG. 35 is a close-up of the drink opening in the base.

Detailed Description

[0050] Referring now to FIGS. 1-16, an assembly of a first embodiment of a reclosable lid assembly 10 and a cup 12 is shown in accordance with the invention. The reclosable lid assembly 10 is preferably removably mounted to the cup 12 for selective use thereon, which aids in the filling of the cup with a suitable liquid and the subsequent mounting of the lid assembly 10.

[0051] Preferably, both the lid assembly 10 and cup 12 are suitable for disposable use in markets such as the fast food or take-out food. In such a market, the cup 12 is preferably made from well known materials such as expanded foam or paper. The cup 12 can be used for either hot or cold liquids and can come in a variety of sizes such as 16, 24, 32, and 44 ounces, for example. Although preferred, the invention is not limited to disposable cups.

[0052] The lid assembly 10 can be manufactured in any suitable manner but is preferably vacuum formed from a thin sheet of plastic material, preferably High Impact Polystyrene (HIPS). It is within the scope of the invention that the lid assembly 10 can be alternatively fabricated from paper products or other suitable composite materials.

[0053] The lid assembly 10 is adapted to matingly engage a rim 14 of the drinking cup 12 to cover the open end of the cup 12 as shown in FIGS. 1-2. The lid assembly 10 comprises a base 16 and a complementary cap 18. As assembled, the base 16 nests within the cap 18 and the cap 18 can be rotated relative to the base to place the lid assembly in either an open or closed position.

[0054] Referring to FIGS. 3-7 specifically and FIGS. 1-2 generally, the base 16 is circular in plan view and generally comprises a cup mount 20 that transitions into a crown 30 from which extends a top wall 34. The cup mount 20 is relatively well known in the art and comprises a downwardly-depending annular skirt 21 in which is provided an indentation forming an inwardly-extending annular rib 28. The upper end of the skirt 21 terminates in an annular lip 26. Depending from the lip 26 is an annular inner wall 22 in opposed relationship to the skirt 21. The skirt 21, the inner wall 22, and the lip 26 define a cup channel 24 adapted to receive the rim 14 of the cup 12 in a press-fit relationship. When the lid assembly is mounted to the cup, the rim 14 is compressed between the inner wall 22 and the rib 28 to frictionally retain the lid assembly 10 on the cup 12 in a manner well-known in the art.

[0055] The crown 30 comprises an annular crown wall 32 that transitions into the top wall 34. The crown wall 32 connects the top wall 34 to an annular floor 27 of the cup mount 20. The crown wall 32 is inclined to the vertical. Preferably, the incline has approximately seven degrees of draft, which also aids in removing the base 16 from a forming mold. The annular floor 27 extends from the crown wall 32 to the inner wall 22. The inner wall 22, the floor 27, and the crown wall 32 define an overflow channel 29 (FIG. 6A). The crown wall 32 is provided with an arcuate sip groove recess 54 proximate to an aperture detent 46 and adapted to receive sip grooves 82, as hereinafter described.

[0056] The top wall 34 comprises an annular rim 36 which defines an indented receptacle 38. The receptacle 38 comprises a receptacle floor 39 and an annular inner wall 40. The rim 36 is provided with a first detent 42, a second detent 44, and an aperture detent 46 positioned between the first and second detents 42, 44. The detents 42, 44 and the aperture detent 46 comprise generally oval-shaped indentations extending beneath the top wall 34 of the rim 36. The detents 42, 44 and the aperture detent 46 comprise an inclined wall 45 connected to the rim 36 by a rounded face 47. For the detents 42, 44, the inclined wall transitions into a floor 43. For the aperture detent 46, the inclined wall transitions into an aperture 49 through which liquids can pass. In the preferred embodiment, the detents 42, 44 are spaced at a detent angle α of 20 degrees on center (FIG. 5).

[0057] The receptacle 38 has a very slight elliptical shape preferably with a major axis B coaxial with a minor axis of the aperture detent 46 (FIG. 3). It will be readily understood that the elliptical receptacle 38 will also have a minor axis (not shown) that is shorter than the major axis B. Opposing slots 48 are formed in the inner wall 40. The slots 48 are positioned laterally outwardly of the inner wall 40 and terminate in stops 55. The inner wall 40 depends from the rim 36 to the floor 39 and is inclined somewhat inwardly from the rim 36 to the floor 39, preferably at a draft of approximately 5-9 degrees. Very slight optional projections 50 are formed in and extend inwardly from the inner wall 40 (FIG. 4). One projection 50 is preferably located along the radial line that extends midway between the detent 42 and the aperture detent 46, and the other projection 50 is preferably located along the radial line that extends midway between the detent 44 and the aperture detent 46.

[0058] As shown in FIGS. 3 and 6-9 specifically and FIGS. 1-2 generally, the cap 18 is adapted to matingly engage the base 16 by nesting with the base. The cap 18 comprises a cap wall 60 and a top wall 62. The cap wall 60 extends in a generally upward direction and is inclined somewhat from the vertical to define a shallow truncated cone. The draft of the cap wall 60 is preferably the same or approximately the same as the crown wall 32 to permit the base 16 to be received within the cap 18 as well as the relative rotation of the cap 18 and the base 16. Grips 76 are formed in the cap wall 60 and are spaced circumferentially about the wall. Two of the grips 76 are closely spaced. The grips 76 generally comprise a series of spaced grooves projecting inwardly from the surface of the cap wall 60. A series of spaced vertical sip grooves 82 are disposed between the closely spaced grips 76.

[0059] The top wall 62 comprises an annular rim 64 which defines an indented receptacle 66. The receptacle 66 comprises a receptacle floor 67 and an annular inner wall 68. The annular rim 64 is provided with a detent 70 and an aperture detent 72. The detent 70 comprises a generally oval-shaped indentation extending beneath the top surface of the rim 64 and functions as a plug for closing the drink opening formed by the aperture detent 46. The detent 70 and the aperture detent 72 comprise a floor 71 and an inclined wall 73. The angle of inclination of the wall 73 is generally greater than the angle of inclination of the inclined face 47. Furthermore, the aperture detent 72 comprises an aperture 79 extending through the rim 64. The detent 70 and the

aperture detent 72 are adapted to matingly engage the detents 42, 44 and the aperture detent 46. When the detents 70, 72 are between the detents 42, 44, 46, which will occur when the cap 18 is rotated between the open and closed positions, the detents 70, 72 will abut the rim 36, thus lifting the cap 18 above the base 16 until the detents are matingly engaged.

[0060] As with the receptacle 38 of the base, the receptacle 66 has a very slight elliptical shape preferably with a major axis C extending midway between the detent 70 and the aperture detent 72 (FIG. 3). It will be readily understood that the elliptical receptacle 66 will also have a minor axis (not shown) that is shorter than the major axis C. Opposing slot sections 74 are formed in the inner wall 68. The slot sections 74 form corresponding bosses 75 (FIG. 9) on the reverse side of the cap 18. The inner wall 68 depends from the rim 64 to the floor 67 and is inclined somewhat inwardly from the rim 64 to the floor 67. The slot sections 74 extend laterally outwardly from the receptacle 66 to define stops 82. The slot sections 74 are adapted to engage the slots 48. The stops 82 are adapted to engage the stops 55 when the cap 18 is rotated on the base 16 beyond a selected position, as hereinafter described.

[0061] Referring now to Figs. 3, 6-7 and 10-18, the assembly and operation of the reclosable lid assembly 10 will now be described. To assemble the base 16 and the cap 18, the cap 18 is aligned with the base 16 so that the bosses 75 are aligned with the slots 48 and preferably, but not necessarily, the aperture detents 46, 72 are aligned. The cap 18 and the base 16 are brought together into a nesting relationship with the upper wall 34 and the crown wall 32 of the base being received within the cap 18.

[0062]

As the base 16 and the cap 18 are nested, the cap inner wall 68 will abut the base inner wall 40. At least the cap 18, and preferably the base 16 and the cap 18, are made from a suitable material and are sufficiently thin that at least the cap inner wall 68, and preferably the base inner wall 40 and the cap inner wall 68, deflect during nesting and permit the lower edge of the cap inner wall 68, and thus the receptacle 66, to pass by the upper edge of the base inner wall 40. As the lower edge of the cap inner wall 68 passes the upper edge of the base inner wall 40, there will preferably be an audible click indicating that the receptacle 66 is nested with the receptacle 38.

Thus, the cap 18 and base 16 are snapped together.

[0063] The snap closing is further enhanced by the sip grooves 82. As best seen in FIG. 6A, the upper edges of the sip grooves 82 effectively form a ledge 83 spaced from the rim 64 to define a gap therebetween that receives the portion of the crown wall 32 between the sip groove recess 54 and the rim 36. As the cap 18 and the base 16 are nested, the cap wall 60 at the sip grooves 82 is deflected over the crown wall 32 until the sip grooves 82 are received within the sip groove recess 54, which will also preferably result in an audible sound.

[0064] If the cap detent 70 and cap aperture detent 72 are not already aligned with and received within the base aperture detent 46 and the base detent 44, respectively, which is the closed position for the lid assembly 10, the cap 18 is rotated relative to the base 16 until the lid assembly 10 is in the closed position. It should be noted that it is not necessary for the lid assembly 10 to be initially set in the closed position. However, it is highly preferred that the lid assembly 10 be initially set in the closed position since it will better insure that when the lid assembly 10 is placed on the cup 12 the lid assembly 10 will be closed and thereby reduce the possibility of spillage.

[0065] Referring to FIGS. 3 and 10-11 in the closed position, a portion of the inclined wall 73 and the detent floor 71 will lie within the aperture detent 46 and form a seal therewith to prevent liquid from flowing out of aperture 49 through and beyond the cap 16. The seal is formed by the cap inclined wall 73 bearing against the base rounded face 47. The difference in draft between the cap inclined wall 73 and the base rounded face 47 enhances the seal therebetween.

[0066] In the closed position, the aperture detent 46 rests within the detent 44. Collectively, the aperture detent 46 and the detent 44 function as a detent for the closed position thereby locking or holding the lid assembly 10 in the closed position. Preferably, the base 16 and cap 18 are constructed such that the user will feel and/or hear the detent 70 and the aperture detent 72 nest within the aperture detent 46 and the detent 44, respectively.

[0067]

Referring to FIGS. 3 and 6-7, the lid assembly can be moved to the open position by relatively rotating the cap 18 with respect to the base 16 such that the cap aperture

[redacted]

detent 72 is aligned with the base aperture detent 46, which aligns the apertures 49 and 79, and the cap detent 70 is received within the base detent 42 to lock or hold the cap 18 in the open position relative to the base 16. The cap aperture detent 72 forms a seal with the base aperture detent 46 in the same manner as previously described for the cap aperture detent 72 and the base detent 44. Similarly, the cap detent 70 and the base detent 42 collectively function as a detent to hold the cap 18 and base 16 in the open position.

[0068] In the open position, liquid in the cup 12 can pass directly through the aligned apertures 49 and 79. Thus, to drink from the cup 12, the user covers the cap aperture detent 72 with his or her mouth. The sip grooves 82 can help the user locate the cap aperture detent 72 by feel.

[0069] By rotating the cap 18 relative to the base 16, the user can alternately place the lid assembly 10 in the open and closed positions to permit the user to drink the contents of the cup 12 and subsequently seal the cup 12 to prevent spilling between drinks. The detents and aperture detents of the cap 18 and the base 16 provide the user with a tactile indication that the lid assembly 10 is locked or held in the desired position.

[0070] The user can relatively rotate the cap 18 and the base 16 by placing his or her fingers on the grips 76 in any manner or orientation comfortable to the user. It is contemplated that the user will use at least one of the closely spaced grips and the other grip so that the user's fingers are in a generally opposing relationship.

[0071] The resulting orientation of the cap 18 and the base 16 upon their relative movement is more complex than is immediately seen and aids in enhancing the seal between the detents and aperture detents along with improving the tactile feel of the lid assembly 10 which is primarily, but not solely, attributable to the very slight elliptical shape of the receptacles 38, 66 along with their inclined inner walls 40, 68. The elliptical shape provides each of the receptacles 38, 66 with vertices or ends located at the point where major axes B, C intersect the inner walls 40, 68.

[0072] The functional result of the elliptical receptacle structure and the location of the major axes B, C is that the vertices of the inner walls 40, 68 of the receptacles 38, 66 are radially aligned when the major axes B, C are aligned, which occurs when the lid

assembly 10 is midway between the open and closed positions (FIGS. 12–15). Thus, in the midway position, the frictional resistance, if any, between the inner walls 40, 68 is minimized. As the lid assembly 10 is moved from the midway position to either the open or closed position, the major axis C of the cap receptacle 66 will rotate relative to the major axis B of the base receptacle 38, resulting in the vertices of the cap receptacle 66 moving towards the minor axis of the base receptacle 38. The contact pressure between the ends of the cap receptacle 66 and the base inner wall 40 will increase as the cap 18 is rotated relative to the base 16 from the midway point to either the open or closed position since the end of the cap is continuously pressed against the base inner wall 40 whose radius of curvature decreases from the major to the minor axis. Since the inner walls 40, 68 are inclined, the continued rotation of the cap 18 relative to the base 16 results in the inner wall 68 moving downward relative to the inner wall 40 urging the cap 18 toward the base 16 and thereby converting the rotational movement of the cap 18 into vertical translation movement of the cap 18 toward the base 16, much like a screw. The depth of the receptacle 38 is preferably, but not necessary, greater than the depth of the receptacle 66 to permit the cap 18 to be drawn toward the base 16 a sufficient amount just prior to or in the absence of contact between the receptacle floors 39, 67.

[0073] The conversion of the rotational movement to the translational movement is best illustrated in FIGS. 13 and 15. FIG. 13 shows the relationship between the cap and base in the midway position where there is a gap between the bottom walls 39, 67. FIG. 15 shows the cap and the base in the closed position where the gap has substantially disappeared because of the translational movement resulting from the rotation of the cap. The translational movement of the cap 18 relative to the base 16 can be thought of as the cap 18 applying a compressive force to the base 16. The compressive force effectively forces the inclined walls 73 of the cap detent 70 and cap aperture detent 72 against the rounded faces 47 of the base aperture detent 46 and the detents 42, 44 as the case may be depending on whether the lid assembly 10 is in the open or closed position. The compressive force enhances and improves the seal between the inclined walls 73 and the rounded faces 47.

[0074] The sip grooves 82 and the sip groove recess 54 further enhance the translational movement of the cap 18 toward the base 16. As best seen in FIGS. 3 and 6A, the

upper edge of the sip groove recess 54 has a slight arcuate shape with the apex of the upper edge located between the aperture detent 46 and the detent 44. Preferably, the sip grooves 82 are of varying height with the shorter sip grooves being located at the sides and the taller sip grooves located in the middle to provide the sip groove ledge 83 with an arcuate profile. When the cap 18 is midway between the open and closed positions, the sip grooves 82 are centered on the apex. As the cap 18 is moved to either the open or closed position, the sip grooves 82 are correspondingly moved. The ledge 83 formed by the upper edges of the sip grooves 82 (FIG. 6A) will ultimately contact the downwardly curving upper edge of the sip groove recess 54 which will also draw the cap 18 toward the base 16.

[0075] It is not necessary to rely upon both the elliptical shape of the receptacles 38, 66 in combination with the inclined inner walls 40, 68 and the sip grooves 82 in combination with the sip groove recess 54 to obtain the translation of the cap 18 toward the base 16. One of the structures is sufficient for the proper function of the invention. However, when combined, the resulting seal is more effective because the compressive force is applied on opposite sides of the detents.

[0076] The projections 50 will further enhance the frictional resistance between the elliptical end (corresponding to the major axis C) of the receptacle 66. Preferably, the projections 50 are located near the rotational limit for the open and closed positions so that the elliptical end contacts the projections 50 just as it reaches either the open or closed positions. Again, it should be noted that the projections 50 are not necessary but do enhance the seal.

[0077]

Referring now to Figs. 16-18, an alternative embodiment of the base 16 is illustrated. In this embodiment, the base 16 is provided with a recess 90 extending generally from the receptacle floor 39 to the inner wall 22. The recess 90 functions as a sump or drain for collecting spilled liquids retained within the overflow channel 29. The recess 90 is effectively a notch in the crown wall 32 and comprises a pair of side walls 92 (only one shown), an inner wall 94, a front wall 96, and a floor 98. The side walls 92 extend generally vertically from the inner wall 22 to the rim 36. The floor 98 preferably has a slight downward and inward slope. A drain aperture 100 is provided in the floor 98. Liquid flowing into the overflow channel 29, such as during drinking

or due to spillage, will flow beneath the cap wall 60 into the recess 90 where it will be drained through the drain aperture 100 into the cup 12. A plurality of recesses 90 can be spaced about the periphery of the base 16 in any number suitable for the anticipated drainage needs.

[0078] Referring now to FIGS. 19-23, a second embodiment 110 of the reclosable lid assembly is illustrated. Referring specifically to FIGS. 19 and 20, the second embodiment lid assembly 110 comprises a base 112 and a cap 114. The base 112 comprises a cup mount 20 and a crown 30. The cup mount 20 is similar to the cup mount described in the first embodiment. The base 112 also comprises a crown 30 and a top wall 34 with a pedestal 116 projecting above the top wall 34. The pedestal 116 comprises a top surface 134 parallel to the top wall 34 with an aperture 136 therethrough, a front wall 146, a back wall 148, and inclined side walls 172, 174. The base 112 is provided with grip recesses 118 in the crown wall 32 spaced on opposite sides of the pedestal 134 and diametrically opposite the pedestal 134.

[0079] The pedestal front wall 146 is provided with an outer groove 130 extending between the side walls 172, 174. The outer groove 130 has a generally arcuate cross section as viewed in FIGS. 22 and 23 and defines an outer lip 138 where the outer groove 130 intersects the front wall 146. The back wall 148 is provided with an inner groove 132 extending between the side walls 172, 174 (FIGS. 20, 23). The inner groove 132 has a generally arcuate cross section as viewed in FIGS. 22 and 23, and defines an inner lip 140 where the inner groove 132 intersects the back wall 148. The top wall 34 is provided with a nose recess 120 extending below the plane of the top wall 34 and having a generally triangular profile.

[0080] Side slots 122 are formed in the crown wall 32 extending generally parallel to the top wall 34. The side slots 122 have a generally arcuate cross section and are provided with end walls 124.

[0081] Referring specifically to FIGS. 19, 20 and 23, the cap 114 is provided with a top wall 62 and a mouthpiece 150 projecting above the top wall 62. The mouthpiece 150 comprises a top surface 162 parallel to the top wall 62, with an aperture 164 therethrough, a front wall 176, a back wall 178, and inclined side walls 180, 182. The top surface 162 defines a mouthpiece inner surface 159 on the reverse side thereof.

[0082] The front wall 176 is provided with a slot defining an outer mouthpiece rib 156 projecting into the interior of the mouthpiece 150. The outer mouthpiece rib 156 is adapted to be received within the outer groove 130 of the pedestal 116. The back wall 178 is provided with an arcuate slot defining an inner mouthpiece rib 158 projecting into the interior of the mouthpiece 150. The outer mouthpiece rib 156 is adapted to be received within the inner groove 132 of the pedestal 134.

[0083] The cap wall 60 is provided with arcuate slots defining side ribs 160 projecting into the interior of the cap 114 and extending generally parallel to the top wall 62. The side ribs 160 are adapted to be slidably received in the side slots 122 and are provided with end walls 161. The cap 114 is additionally provided with grips 152 spaced circumferentially at locations corresponding to the grip recesses 118 of the base 112. The grips 152 comprise indentations in the cap wall 60 and are adapted to be received within the grip recesses 118 when the cap 114 is mounted to the base 112.

[0084] The top wall 62 is provided with a nose recess 154 extending below the plane of the top wall 62. The nose recess 154 has a generally triangular shape and is adapted to receive a user's nose. The nose recess 154 is adapted on the cap 114 so that its apex is diametrically opposite the mouthpiece 150.

[0085] The assembly and function of the second embodiment is substantially similar to the first embodiment. Therefore, only the pertinent distinctions will be described in detail. To assemble the second embodiment lid assembly, the cap 114 is aligned with the base 112 such that the grips 152 correspond with the grip recesses 118. The cap 114 and base 112 are then nested such that the cap 114 is snapped onto the base 112 by pressing the cap 114 onto the base 112 until the outer mouthpiece rib 156 is received in the outer groove 130, the inner mouthpiece rib 158 is received in the inner groove 132, and the side ribs 160 are received in the side slots 122. The grips 152 will be received within the grip recesses 118 and the nose recess 154 will be received within the nose recess 120. Advantageously, the nose recesses 120, 154 aid in aligning the cap 114 and the base 112.

[0086] When the cap 114 and the base 112 are snapped together, the inner surface 159 of the mouthpiece 150 will be in slidable contact with the top surface 134 of the

pedestal 116. The outer mouthpiece rib 156 is adapted to bear against the outer lip 138, and the inner mouthpiece rib 158 is adapted to bear against the inner lip 140 when the cap 114 is snapped onto the base 112, thereby urging the inner surface 159 into contact with the top surface 134. With the base 112 attached to the cup 12, the cap 114 can be rotated relative to the base 112 by grasping the grips 152 and turning the cap 114. The cap 114 can be rotated between a first position in which the apertures 136, 164 are aligned and a second position in which the apertures 136, 164 are offset. Rotation of the cap 114 relative to the base 112 will be limited by contact of the end walls 161 of the inwardly projecting side ribs 160 with the end walls 124 of the side slots 122.

[0087] Although the base grooves 130, 132 and the corresponding cap ribs 156, 158 are illustrated as having a generally straight profile, at least one of the grooves and ribs can have an arcuate profile so that as the cap 114 is turned relative to the base 112, the cap 114 is drawn onto the base 116 to improve the seal between the apertures 136, 164 similar to the interaction of the ledge 83 and the sip groove recess 54 of the first embodiment.

[0088] Furthermore, the apertures 136, 164 can be made in the same manner as the detent apertures and detents of the first embodiment such that the apertures 136, 164 have abutting surfaces that perform a sealing function and/or a locking or holding function similar to the first embodiment.

[0089] Referring now to FIGS. 24-30, a third embodiment of the reclosable lid assembly 190 is shown. As shown in FIGS. 24-26, the reclosable lid assembly 190 comprises a generally circular base 192 and a generally circular cap 194. The base 192 comprises a cup mount 196 and a crown 214 extending upwardly therefrom. The cup mount 196 comprises a circumferential skirt 198 depending from an annular lip 208. Intermediate the annular lip 208 and the circumferential skirt 198 is an annular rib 202 extending radially inwardly from the skirt 198.

[0090] Extending inwardly of the annular lip 208 is a circumferential inner wall 210 depending therefrom and transitioning to an annular floor 212 (Figs. 27-28). The circumferential inner wall 210 and the annular lip 208 define a cup channel 206 to matingly engage the rim 14 of the cup 12 as previously described with respect to the

previous embodiments.

[0091] The crown 214 comprises a circumferential crown wall 216 of variable height extending upwardly from the floor 212 and an irregularly shaped top wall 218. The crown wall 216 transitions into the top wall 218, which defines a plane that is orthogonal to an axial centerline of the base 192. The top wall 218 is provided with a base receptacle 224 extending below the plane of the top wall 218.

[0092] The base receptacle 224 has a generally arcuate longitudinal profile and extends diametrically from a line of intersection 215 with the top wall 218 to smoothly transition to an aperture floor 226. The aperture floor 226 defines a plane which is parallel to the plane of the top wall 218 and the plane of the floor 212, and intermediate thereof. The base receptacle 224 also comprises receptacle walls 230, 232, which intersect the top wall 218 along generally arcuate lines.

[0093] The aperture floor 226 extends from the base receptacle 224 to the crown wall 216, and is provided with a generally circular drink aperture 228 defined by a drink aperture periphery 229.

[0094] The base 192 is also provided with a detent slot 234 and a detent receptacle 236. The detent slot 234 comprises a generally arcuate indentation in the base 192 comprising a floor 235 defining a plane which is parallel to the plane of the aperture floor 226 and the floor 212, and intermediate thereof. The floor 235 intersects the crown wall 216 along one edge thereof. The floor 235 transitions to the top wall 218 through an upwardly extending upper slot wall 238 at a distal end of the detent slot 234. The floor 235 transitions to the aperture floor 226 through an upwardly extending lower slot wall 240 at a proximal end of the detent slot 234. The upper slot wall 238 transitions to the lower slot wall 240 along an inner edge of the detent slot 234 and the receptacle wall 232 to define a generally upwardly extending wall of progressively decreasing height relative to the floor 235 for receipt of a throat portion 250 of the cap 194 during rotation of the cap 194 relative to the base 192.

[0095] The detent receptacle 236 comprises a generally D-shaped indentation in the base 192 comprising a floor 237 defining a plane which is parallel to the plane of the aperture floor 226 and the floor 212, and intermediate thereof. The floor 237

intersects the crown wall 216 along one edge thereof. The floor 237 transitions to the top wall 218 through an upwardly extending upper detent wall 242 at a distal end of the detent receptacle 236. The floor 237 transitions to the aperture floor 226 through an upwardly extending lower detent wall 244 at a proximal end of the detent receptacle 236. The upper detent wall 242 transitions to the lower detent wall 244 along an inner edge of the detent receptacle 236 to define a generally upwardly extending wall of progressively decreasing height relative to the floor 235.

[0096] The cap 194 comprises a generally circular top wall 222 defining a plane which is orthogonal to the axial centerline of the cap 194 and a circumferential cap wall 220 depending therefrom and terminating in a cap annular skirt 200. Intermediate the cap wall 220 and the cap annular skirt 200 is an annular rib 204 (Figs. 27-28) extending radially inwardly from the skirt 200 and the wall 220. The diameter of the circle defined by the cap annular rib 204 is generally equal to the diameter of the circle defined by the base annular rib 202 so that the cap annular rib 204 can be snap-fit onto the base annular rib 202 for nesting of the cap 194 over the base 192.

[0097] The top wall 222 is provided with a cap receptacle 246 extending below the plane of the top wall 222. The cap receptacle 246 has a generally circular shape. Extending radially outwardly from the cap receptacle 246 is a throat portion 250 opening into a detent in the form of a funnel 252. The cap receptacle 246 in combination with the throat 250 forms a condiment channel that will direct a condiment, such as cream, into the drink funnel 252 when poured into the cap receptacle 246. The cap receptacle 246 is provided with a plurality of upwardly extending ribs 248 which define flow channels to direct liquid from the cap receptacle 246 through the throat portion 250 and into the drink funnel 252.

[0098] The drink funnel 252 is a generally irregularly shaped indentation in the cap 194 comprising an outer wall 254 and sidewalls 256, 258. The outer wall 254 is a generally arcuate surface extending downwardly from the top wall 222 adjacent and radially inwardly of the cap wall 220. The sidewalls 256, 258 are generally arcuate surfaces extending downwardly from the top wall 222 and smoothly transition from the outer wall 254 to the throat portion 250. The lower portion of the drink funnel 252 comprises a generally truncated cone shaped funnel wall 259 terminating in a

truncated spherical portion 261 which, in turn, terminates in a funnel floor 260. The funnel floor 260 is provided with a funnel aperture 262 extending therethrough. The outer wall 254 and the sidewalls 256, 258 are adapted to transition smoothly into the funnel wall 259, and the funnel wall 259 is adapted to transition smoothly into the spherical portion 261.

[0099] On either side of the drink funnel 252 are detents 264, 270. The detent 264 is an indentation having the shape of a generally truncated cone. The detent 264 comprises a detent perimeter wall 268 terminating in a truncated spherical portion 269 which, in turn, terminates in a detent floor 266. The detent 270 is similar in shape to the detent 264 and has a generally truncated cone shape. The detent 270 comprises a detent perimeter wall 274 terminating in a truncated spherical portion 275 which, in turn, terminates in a detent floor 272.

[0100] The edge formed by the intersection of the top wall 222 with the cap wall 220 is provided with a plurality of grip serrations 278 along a substantial portion thereof to facilitate the rotation of the cap 194 relative to the base 192. Proximate the drink funnel 252 a plurality of sip grooves 276 are formed in the cap wall 220 along a portion thereof extending vertically downwardly from the top wall 222.

[0101] To assemble the reclosable lid assembly 190, the cap 194 is brought into alignment with the base 192 preferably so that the detent 264 is aligned with the detent receptacle 236, which is adapted to receive the detent 264 so that the detent receptacle floor 237 lies somewhat below the detent floor 266 when the cap 194 is nested on the base 192. At the same time, the detent 270 is aligned with the proximal end of the detent slot 234. The detent slot 234 is adapted to receive the detent 270 so that the detent slot floor 235 lies somewhat below the detent floor 272 when the cap 194 is nested on the base 192. The drink funnel aperture 262 will be in axial alignment with the drink aperture 228.

[0102] The cap 194 is urged into nested communication with the base 192 so that the cap annular rib 204 snaps into the base annular rib 202 to retain the cap 194 on the base 192 while enabling rotation of the cap 194 relative to the base 192. It should be noted that the cap 194 can be snap-fit to the base in any rotational position where the detents 264, 270 and the drink funnel 252 lie between the upper slot wall 238

and the upper detent wall 242. For purposes of this description, it is presumed that the detent 264 is aligned with the detent receptacle 236.

[0103] The drink funnel 252 and the drink aperture 228 are adapted so that when the cap 194 is nested with the base 192, the drink funnel floor 260 will extend through the drink aperture 228 and below the aperture floor 226, and the drink funnel 252 will be urged downwardly into the drink aperture 228 with the sidewall of the drink funnel 260 bearing against the peripheral edge 229 to form a seal therebetween.

[0104] The cap 194 can be rotated relative to the base 192 between an open and a closed position. Figs. 27 and 28 show the lid assembly 190 in an open position. Figs. 29 and 30 show the lid assembly 190 in a closed position. In the open position, the detent 264 is received within the detent receptacle 236, and the detent 270 is received within the detent slot 234. The lower portion of the drink funnel 252 is received within the drink aperture 228 so that the truncated spherical portion 261 is in sealing communication with the periphery 229 of the drink aperture 228 due to the engagement of the cap annular rib 204 with the base annular rib 202. The truncated spherical portion 261will be urged into sealing communication with the periphery 229 similar to a ball bearing being retained in a circular seat.

[0105] To close the lid assembly 190, the cap 194 is rotated in a clockwise direction relative to the base 192 to translate the drink funnel 252 from communication with the drink aperture 228 to the detent slot 234. At the same time, the detent 264 is translated from the detent receptacle 236 to the drink aperture 228 so that the truncated spherical portion 269 is in sealing communication with the periphery 229, and the detent 270 is translated along the detent slot 234 from the proximal end adjacent to the lower slot wall 240 to the distal end adjacent to the upper slot wall 238. The truncated spherical portion 261 facilitates the translation of the drink funnel 252 out of the drink aperture 228, along the aperture floor 226, and into the detent slot 234. The truncated spherical portion 269 facilitates the translation of the detent 264 out of the detent receptacle 236, along the aperture floor 226, and into the drink aperture 228. Further rotation of the cap 194 relative to the base 192 is prevented by contact of the detent 270 with the upper slot wall 238.

[0106] The snap-fit of the cap annular rib 204 with the base annular rib 202 maintains

the detent truncated spherical portion 269 in sealing communication with the drink aperture 228 by preventing the cap from pulling away from the base upon rotation. However, the shape of the cap does permit the top wall 222 to deflect upwardly in response to the bottom of the drink funnel 252 or detent 264 riding up and onto the aperture platform 226. The upward deflection of the top wall 222 places the top wall under tension which tends to bias the drink funnel 252 or the detent 264 against the aperture platform. Thus, when either the drink funnel 252 or detent 264 aligns with the drink opening 228, the drink funnel truncated spherical portion 261 or the detent truncated spherical portion 269 is biased into and against the periphery 229 of the drink aperture 228, thus sealing the drink aperture 228 and preventing spillage of the contents of the cup 12 through the drink aperture 228.

[0107] To open the lid assembly 190, the cap 194 is rotated in a counterclockwise direction relative to the base 192 so that the drink funnel truncated spherical portion 261 is translated from the detent slot 234 to the drink aperture 228, the detent truncated spherical portion 269 is translated from the drink aperture 228 to the detent receptacle 236, and the detent 270 is translated along the detent slot 234 from the distal end adjacent to the upper slot wall 238 to the proximal end adjacent to the lower slot wall 240.

[0108] Figures 31-35 illustrate a fourth embodiment lid assembly 310 comprising a base 316 and a complementary cap 318. The base 316 and cap 318 are mounted such that they rotate relative to each other.

[0109] The base 316 comprises a cup mount 320 that transitions into a crown 330. The cup mount 320 is substantially identical to the previously described cup mounts and comprises a downwardly-depending annular skirt 321 in which is provided an indentation forming an inwardly-extending annular rib 328. The upper end of the skirt 321 terminates in an annular lip 326. Depending from the lip 326 is an annular inner wall 322 in opposed relationship to the skirt 321. The skirt 321, the inner wall 322, and the lip 326 define a cup channel (not shown) adapted to receive the rim 14 of the cup 12 in a press-fit relationship.

[0110] The crown 330 transitions into a top wall 334 comprising an annular rim 336 which defines the opening to a well or receptacle 338. The receptacle 338 has a floor

339 and an annular inner wall 340, which generally slopes upwardly and outward from the floor 339 to the rim 336. An annular undercut in the form of groove 342 is formed in the inner wall 340.

[0111] Preferably, the undercut is adjacent the floor 339 and forms the junction of the inner wall 340 with the floor 339. The groove 342 can be formed by sloping a portion 340a of the wall 340 inwardly and upwardly from the floor as compared to the remaining portion of the wall 340b. The intersection of the two portions 340a and 340b forms a rib 340c, which defines the upper boundary of the groove 342.

[0112] The base 316 also includes spacers 350 extending upwardly from the floor 339 and spaced thereabout. A key 352, taller than the spacers, also extends upwardly from the floor 339.

[0113] A drink opening 354 is formed in the floor 339. The drink opening 354 is bounded by a raised rim 356 extending upwardly from the floor 339. The height of the rim 356 is preferably approximately the same height as the spacers 350. A depending peripheral wall 358 extends from the rim 356 and terminates in a bottom wall 360 in which is formed an opening 362. With this structure, the drink opening 354 effectively forms a well. It is within the scope of the invention for the drink opening 354 to be just an opening in the floor 339 without the well.

[0114] A guide channel 364 is formed in the inner wall 340 adjacent the drink opening 354. The guide channel 364 helps guide liquid from the drink opening 354 to the user's mouth.

[0115] The cap 318 comprises a generally planar disk 370 having a circular periphery that is interrupted by an arcuate notch 372. The notch 372 is preferably sized such that it defines an open area larger than the drink opening 354, but the edge of the notch will rest on the rim 356 when the cap 318 is assembled to the base 316 and the lid is in the open position.

[0116] The cap 318 also includes a grip 374 for assisting the user in rotating the cap 318. The grip 374 can take many forms but is preferably three elongated projections 376, 378, 380 extending radially from a cylindrical projection 382, much like a spoke and hub configuration. The elongated projections 376, 378 are slightly curved when

viewed from above. The elongated projection 380 is generally straight. Each of the elongated projections increase in height as they extend away from the cylindrical projection 382, until they reach a peak, which is quickly tapered to the disk 370. Each of the elongated projections has a U-shaped transverse cross section along the portion from the cylindrical projection to the peak. The cylindrical projection 382 can have a vent opening formed in its top, wherein the cylindrical projection 382 functions like a chimney.

[0117] A rotation stop 384 also extends from the disk 370. The rotation stop 384 is generally arcuate in plan form and has a trapezoidal transverse cross section. The rotation stop defines an interior channel that is sized to receive the key 352 when the cap 318 is mounted to the base 316. Thus, as the user rotates the cap 318 by grasping the grip 374, the rotation will be stopped when the ends of the rotation stop 384 encounter the key 352.

[0118] The rotation stop 384 can be used to index the rotation of the cap 318 relative to the base 316 to operate the lid between the open and closed positions. When the key 352 bears against one of the ends of the rotation stop 384, the notch 372 will not overlie the drink opening 354, and the lid will be in the closed position. When the key 352 bears against the other end of the rotation stop 384, the notch 372 will overlie the drink opening 354, and the lid will be in the open position.

[0119] The cap 318 is rotatably mounted to the base 316 by pressing the cap 318 into the well until the outer periphery of the disk 370 is received within the groove 342. The outer diameter of the disk 370 is greater than the rib 340c. Thus, the disk 370 must be temporarily deflected for the disk 370 to be received within the grooves.

[0120] Preferably, the spacers 350 are of such a height that they keep the height of the disk 370 relative to the floor 339 such that the outer periphery of the disk 370 is urged up against the wall portion 340a of the groove, which tends to form a partial seal between the edge of the disk 370 and the base 316. The urging of the periphery of the disk 370 against the wall portion 340a creates a resistance that retards the rotation of the cap 318 relative to the base 316, which helps to hold the cap 318 in the selected rotational position.

[0121] The fifth embodiment lid shown is FIGS 31-35 is advantageous over the other lids in its simplicity, while still providing a recloseable lid.

[0122] In the past, multi-piece recloseable lids have typically been made using injection molding because of the design complexity and the intended reuse of the lids. The lids according to the invention can be made by injection molding. However, injection molding is not preferred. It is preferred that the lids according to the invention be made using a thermoforming or vacuum forming process, which will greatly enhance their suitability for disposable use. In fact, their structure, makes them ideal for manufacture by thermoforming or vacuum forming since they do not require different thicknesses for structural integrity or complex shapes for assembly or operation, which would eliminate thermoforming and vacuuming forming as an option.

[0123] While the invention has been specifically described in connection with certain specific embodiments thereof, it is to be understood that this is by way of illustration and not of limitation. Reasonable variation and modification are possible within the scope of the forgoing description and drawings without departing from the spirit of the invention.